

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>F-12885/PCT-MS</b>	<div style="display: flex; justify-content: space-between;"> <div> <b>FOR FURTHER ACTION</b> </div> <div>           See Form PCT/PEA/416         </div> </div>	
International application No. <b>PCT/IL2004/000714</b>	International filing date ( <i>day/month/year</i> ) <b>03.08.2004</b>	Priority date ( <i>day/month/year</i> ) <b>11.08.2003</b>
International Patent Classification (IPC) or national classification and IPC <b>G01J5/52</b>		
Applicant <b>OPGAL LTD.et al.</b>		
<ol style="list-style-type: none"> <li>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</li> <li>2. This REPORT consists of a total of 11 sheets, including this cover sheet.</li> <li>3. This report is also accompanied by ANNEXES, comprising:               <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> <i>sent to the applicant and to the International Bureau</i> a total of 11 sheets, as follows:                   <div style="margin-left: 20px;"> <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).                   <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.                 </div> </li> <li>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</li> </ol> </li> </ol>		
<ol style="list-style-type: none"> <li>4. This report contains indications relating to the following items:               <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I      Basis of the opinion  <input type="checkbox"/> Box No. II     Priority  <input checked="" type="checkbox"/> Box No. III    Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  <input checked="" type="checkbox"/> Box No. IV    Lack of unity of invention  <input checked="" type="checkbox"/> Box No. V     Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement  <input type="checkbox"/> Box No. VI    Certain documents cited  <input type="checkbox"/> Box No. VII    Certain defects in the international application  <input type="checkbox"/> Box No. VIII   Certain observations on the international application                 </div> </li> </ol>		
Date of submission of the demand  <b>15.06.2005</b>	Date of completion of this report  <b>02.08.2005</b>	
Name and mailing address of the international preliminary examining authority:  <div style="display: flex; align-items: center;"> <div>             European Patent Office              D-80298 Munich              Tel. +49 89 2399 - 0 Tx: 523656 epmu d              Fax: +49 89 2399 - 4465           </div> </div>	Authorized Officer  <b>Jacquin, J</b>  Telephone No. +49 89 2399-8040	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/IL2004/000714

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-30 as originally filed

**Claims, Numbers**

1-61 received on 15.06.2005 with letter of 15.06.2005

**Drawings, Sheets**

1/17-17/17 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☒ the claims, Nos. 59,62
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/IL2004/000714

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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

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1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 18,41,50-53, 58-60

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the said claims Nos. 18,41,50-53,58-60

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☐ See separate sheet for further details

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/IL2004/000714

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**Box No. IV Lack of unity of invention**

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1. ☒ In response to the invitation to restrict or pay additional fees, the applicant has:
- ☐ restricted the claims.
  - ☐ paid additional fees.
  - ☐ paid additional fees under protest.
  - ☒ neither restricted nor paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- ☐ complied with.
  - ☒ not complied with for the following reasons:  
**see separate sheet**
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
  - ☒ the parts relating to claims Nos. 1-17,19-40,42-49,54-57,61 .

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	6-10,13,14,19,22,32,34-37,47,49,55-57
	No: Claims	1-5,11,12,15-17,20,21,23-31,33,38-40,42-46,48,54,61
Inventive step (IS)	Yes: Claims	
	No: Claims	6-10,13,14,19,22,32,34-37,47,49,55-57
Industrial applicability (IA)	Yes: Claims	1-17,19-40,42-49,54-57,61
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/IL2004/000714

**Prior Art**

Reference is made to the following documents:

D1: WO0184118  
D2: JP2000131149  
D3: EP837600

**Section III**

Since the subject-matter of claims 18, 41, 50 to 53 and 58 to 60 has not been searched, no examination of these claims can be carried out.

**Section IV**

The International Searching Authority considers that the present application contains 2 inventions. This observation is based on the following reasons:

The prior art has been identified as WO0184118 (D1).

a. The subject-matter of independent claims 1, 23, 42 and 54 is not novel with respect to D1 (see section V below).

b. From the comparison with D1, the following technical features of claim 13 can be seen to make a contribution over this prior art (Special Technical Features, Rules 13(2)):

- the shutter comprises a sheet having a reflectivity approaching 1.

From this Special Technical Feature the objective problem to be solved by the first invention can be construed as providing an alternative way of measuring the temperature of the sensor array itself.

c. From the comparison with D1, the following technical features of claim 18 can be seen to make a contribution over this same prior art:

- the uncooled sensor is equipped to overcome the error introduced by a camera modulation transfer function for high spatial frequencies, by incorporating an inverse of the modulation transfer function.

From this Special Technical Feature the objective problem to be solved by the second invention can be construed as ensuring that the same object, kept at a constant temperature but placed at different distances from the camera, is measured as having a constant temperature.

d. The above analysis shows that the Special Technical Features of invention 1 are not the same or similar to those of invention 2.

A comparison of the objective problem 1 with objective problem 2, both seen in the light of the description and the drawings of the present application, indicates that there is no technical correspondence between these problems nor do they show any corresponding technical effect, so that the Special Technical Feature of invention 2 (claims 18, 41, 50 to 53, 58 to 60) fail to demonstrate a correspondence with the Special Technical Features of invention 1 (claims 1 to 17, 19 to 40, 42 to 49, 54 to 57, 61) as required by Rule 13.1 and 2 PCT.

## **Section V**

### **1- Objections as to lack of clarity (Art. 6 PCT)**

a) Although apparatus **claims 1 and 23** have been drafted as separate independent claims, they appear to relate effectively to similar subject-matters and therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

The same remark applies to method **claims 42 and 54**.

**b)** The expression "local camera temperature" used in **claim 23** is not defined and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear. The same remark applies to the expression "a temperature sensor for determining a local camera temperature using said measurement surface".

**c)** The expression "obtain calibration temperature measurements from a video signal of an internal reference unit" used in **claim 17** is vague and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear. The part "from a video signal of an internal reference unit" has therefore been considered as being not limiting.

Hence, claims 1, 17, 23, 42 and 54 do not meet the requirements of Article 6 PCT.

## **2- Objections as to lack of novelty (Art. 33(2) PCT)**

Insofar as the claims can be understood (see the above clarity objections), the present application does not meet the requirements of Article 33(2) PCT, because the subject-matter of claims 1 to 5, 11, 12, 15 to 17, 20, 21, 23 to 31, 33, 38 to 40, 42 to 46, 48, 54 and 61 is not novel. The reasons are the following:

### **2- 1. Independent claims 1, 23, 42, 54**

#### **Claim 1**

D1 discloses an infrared imaging camera (p. 7, l. 22) comprising

- an uncooled and unshielded detector arranged to detect infrared radiated energy (array of bolometers : p. 7, l. 23), and
- a calibrator (temperature sensor 36 or shutter 26 in figure 1) to carry out periodic calibration operations by taking at least one calibration temperature measurement over said camera (p. 19, l. 11-15 or p. 32, l. 15-19) and to derive from said at least one calibration temperature measurement a reference temperature indicative of radiated

energy not from an external scene, said reference temperature being usable to correct energy detected at said uncooled sensor to discount energy not from an external scene, thereby to enable energy at said detector to be translated into a temperature of objects in said camera's field of view (p. 19, l. 20-25).

Hence all features of claim 1 are already known from D1.

It has to be noted that the reference temperature referred to in claim 1 does not appear to be necessarily a single reference for all detectors. And even if it is understood as being a single reference, D1 still anticipates claim 1 because it encompasses the case of a global correction applied to all detectors (p. 19, l. 11 to 25).

### **Claim 23**

D1 discloses a temperature correction apparatus, for correcting a response of a radiometer in accordance with a local camera temperature, said radiometer comprising

- an unshielded uncooled infrared sensor (element 32 in figure 1), for providing an image response in order to form a temperature image in accordance with IR radiation impinging on said IR sensor's field of view (FOV), and
- a shutter (element 26), for controllably obscuring said FOV, an internal face of said shutter forming a measurement surface for an internal temperature reference unit ;

said temperature correction apparatus comprising

- a temperature sensor (element 36) for determining a local camera temperature (the temperature of the semiconductor surface on which the sensor 32 is integrated) using said measurement surface (the output of sensor 36 is read when the shutter is closed),
- a referencer (controller 38 in figure 1), for deriving from said local camera temperature a reference temperature indicative of radiated energy not from an external scene and for using a response of said IR sensor to said local camera temperature to approximate a temporal effect of temperature drift of said local temperature (p. 19, l. 11-25, p. 33, l. 5-11, and p. 34, l. 14 until p. 35, l. 20), and
- a signal corrector associated with said temperature sensor and said referencer, said signal corrector being configured to discount impinging IR radiation not from an external source by producing a correction to said image in accordance with said approximated



temporal effect and said reference temperature (p. 33, l. 11-12).

Hence all features of claim 23 are already known from D1.

It has to be noted that the reference temperature referred to in claim 23 does not appear to be necessarily a single reference for all detectors.

Even if the temperature sensor is understood to perform a measurement of the shutter temperature, it is not inventive because, in case of need of a shutter temperature value to be input to the software processing unit of the camera, it is an obvious solution for the skilled person to provide a sensor on the shutter. An example of such a shutter having a temperature sensor can be found in D3 (figure 1, element 5).

**Claim 42**

This method claim corresponds to apparatus claim 1, and is not novel with respect to D1, for the same reasons.

**Claim 54**

In D1, focusing optics are implicitly disclosed : they are necessary for gathering infrared energy from an external scene. Moreover, as already mentioned above, an uncooled detector and a shutter mounted to periodically obscure the field of view of the detector are present in D1. Further, the method step of applying a temperature sensor within the camera for allowing a localized temperature measurement to be taken at periodic intervals for use in deriving a reference temperature indicative of radiated energy not from an external scene, for the correction of a received image, is disclosed too (see element 36 in figure 1, and page 32, line 24 until page 33, line 4).

Hence all features of claim 54 are already known from D1.

**2- 2. Dependent claims**

**Claim 2 :** This claim does not bring additional information with respect to claim 1.

**Claims 3, 4 :** Already known from D1 (p. 19, l. 23-25 and p. 33, l. 5-18).

**Claim 5 :** In D1, the initial offset is provided by a measurement of a shutter of the camera, carried out by the sensor array.

**Claims 11, 12, 33, 48 :** The use of a blackbody as radiation reference is known from D1 (p. 29, l. 19-21).

**Claims 15, 40 :** Known from D1 (p. 8, l. 19-21 and p. 29, l. 16-19).

**Claims 16, 25, 26, 29, 44 :** Known from D1 (p. 13, l. 14-20).

**Claim 17 :** Insofar as this claim can be understood, the detector in D1 is configured to obtain calibration temperature measurements.

**Claims 20, 61 :** Known from D1 (p. 29, l. 22 until p. 30, l. 18).

**Claims 21, 31, 46 :** A variation compensation mechanism to form a non-uniformity correction matrix to overcome variation between pixels of the detector array is mentioned in D1 (p.16, l. 21 until p. 17, l. 17). In the next paragraph (p. 17, l. 18-31) the use of an unique "TCR" function is disclosed, be it a linear, non-linear, or a piece-wise linear approximation transfer function, to be applied to all pixels for the purpose of dynamically adjusting the offset error calibration parameters corresponding to each pixel.

**Claim 24 :** Known from D1 (p. 33, l. 5-8 : the output of sensor 36 is necessarily read during a previous shutter measurement).

**Claim 27 :** Known from D1 (p. 33, l. 19 to p. 34, l. 13).

**Claim 28 :** An example of an extrapolation of two successive temperature measurements which is then used in a dynamic (temporal) adjustment of the calibration parameters is given in D1 (p. 29, l. 3 until p. 31, l. 9).

**Claim 30, 45 :** This is one of the standard correction procedures to be carried out by the device disclosed in D1 (p. 16, l. 19 until p. 17, l. 6).

**Claims 38, 39 :** The controller in D1 is operable to perform all types of operations, and produces corrected images using numerical processing.

**Claim 43 :** Known from D1 (p. 33, l. 5-18).

### **3- Objections as to lack of inventive step (Art. 33(3) PCT)**

The present application does not meet the requirements of Article 33(3) PCT, because the subject-matter of claims 5 to 10, 13, 14, 19, 22, 32, 34 to 37, 47, 49 and 55 to 57 does not involve an inventive step. The reasons are the following:

**Claims 5, 6 :** Thermal calibration parameters are always a function of the temperatures of different elements used in the detecting apparatus. If the software processing unit of the camera includes a formula involving the temperature of the camera housing, it is obvious to provide said housing with a sensor in order to measure its temperature.

**Claims 7, 8, 19 :** It is well known to perform a plurality of measurements in order to reduce noise (by averaging, see for example p. 30, l. 13), and it is common sense to carry out these measurements within the camera thermal time constant.

**Claim 9 :** The problem to be solved by this claim can be construed as knowing the temperature of a number of elements of the camera. Providing thermistors on these different elements is only an obvious way of solving this problem.

**Claim 10 :** This is the usual embodiment of a shutter.

**Claims 13, 14, 36, 49 :** These claims differ from the teachings of D1 in that a high reflectivity shutter is provided. The technical effect of this feature is to provide as a reference temperature the temperature of the microbolometer array itself. In D1, this temperature is known from temperature sensor 36. With respect to D1, the problem to be solved by claim 13 can be construed as finding an alternative way of knowing the temperature of the sensor array.

However, the feature of a high reflectivity shutter has already been employed for calibration purposes in a similar device, see document D2 (abstract). It would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to a device according to document D1, thereby arriving at a device according to claim 13.

**Claims 22, 32, 47 :** Bad pixel replacement is a standard procedure in the art of thermal sensor calibration.

**Claims 34, 35, 37, 55, 56 :** According to the needs of the software used in the apparatus, the temperatures from different elements of this apparatus are required in order to perform a calibration of the values measured by the sensor array. Providing a temperature sensor on the shutter or on any other element is a straightforward solution for the skilled person. An example of such a shutter having a temperature sensor can be found in D3 (figure 1, element 5).

**Claim 57 :** This is obvious, since the temperature of the shutter is mostly relevant only during the calibration procedure (when the shutter is closed).